Name:

Date:

**Warm-Up**

1. **Division:** 

|  |  |  |
| --- | --- | --- |
| What happens when you divide 1 whole by a very small number like ? Explain why this happens. | Explain why is an impossible equation. | What happens when you divide 1 whole by a very large number like 1,000,000? Explain why this happens. |

1. **Distance, Speed and Time:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| You are going for a 100-mile road trip. How long will the trip take you if…   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Speed | 25 mph | 50 mph | 100 mph | 1 mph | 10 mph | 0.5 mph | 200 mph | | Trip Time |  |  |  |  |  |  |  |   What shape do you think the graph will make if we graph speed on the *x*-axis and time on the *y*-axis?   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | | Is this a linear function? Why or why not? | | As your speed increases, what happens to your travel time? Why does this happen? | |

1. **Prom Ticket Prices:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| The Prom committee is trying to decide how much to charge for a Prom ticket. They know that the total cost of the DJ, the venue and the decorations will be $2,000. Also, each person’s food will cost $15. How much should they charge per ticket if *n* people attend?   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | # of students | 0 | 1 | 10 | 50 | 100 | 200 | 1000 | | ticket price |  |  |  |  |  |  |  |   How can you write an equation to match this data table? |
| What happens to the ticket price as the number of people increases? Why does this happen? |

1. **Mixing Lemonade:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| You mix together some lemonade mix and some water. There are 5 liters in this mixture and it is 75% lemonade mix. You taste it and it is way too sweet. You start adding more water. If you add *x* liters of water, what is the concentration of the new mixture?   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Liters of water added | 0 | 1 | 2 | 10 | 20 | 100 | 1000 | | Concentration of New mixture |  |  |  |  |  |  |  | |
| Write an equation to match this data. |
| What happens to the concentration as more water is added? Why does this happen? |

1. **Planning a Party:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| You are planning a party. The location you rent costs $300. The food costs $10 per person. There are 20 special guests who will not need to pay but do need to eat, but the cost will be divided evenly among the remaining guests. What is the cost per person?   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | # of guests (including special guests) | 25 | 30 | 40 | 50 | 80 | 100 | 200 | | Cost per guest |  |  |  |  |  |  |  |   What shape do you think the graph will make if we graph # of guests on the *x*-axis and cost per guest on the *y*-axis?   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | | Write an equation to match this function. Express the equation two different ways. | | As the number of guests increases, the cost per guest approaches. . .  As the number of guests approaches 0, the cost per guest approaches. . . | |

**Applications of Rational Functions**

**Part 1: Appliance Costs**

Consider a new refrigerator that costs $550. It costs $92 per year to pay for the electricity to run the refrigerator.

1. Find the yearly cost of running the refrigerator if you own the refrigerator for *x* years:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of Years | 0.25 | 0.5 | 1 | 2 | 5 | 10 | 15 | 20 | 40 |
| Yearly Cost of Ownership |  |  |  |  |  |  |  |  |  |

1. Create a graph of the data above.

1. Write a function to match this data table. Write the function two different ways.

1. Explain:
   1. What happens to the yearly cost of ownership as the number of years increases? Explain why this happens. How does the graph show this?

* 1. Does the yearly cost of ownership ever reach $0? Explain why or why not. How does the graph show this?

* 1. What happens to the yearly cost of ownership if you own the refrigerator for less than a year? Explain why this happens. How does this graph show this?

1. Write two approach statements to describe this graph.

**Part 2: Travel Time**

You are going for a road trip. You plan to drive 40 miles to your destination, spend 3 hours at your destination and then drive 40 miles back home. You will drive at a constant speed, the same speed on the way there as on the way back.

1. Find the total time your trip will take you if you travel at the speeds given below.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Speed | 40 mph | 20 mph | 10 mph | 80 mph | 60 mph | 1 mph | 0.5 mph |
| Total time |  |  |  |  |  |  |  |

1. Create a graph of the data above.

1. Write a function to match your graph and data table.

1. Explain:
   1. What happens to the total time the trip takes as your speed increases? Why does this make sense? How does the graph show this?

* 1. What happens to the total time the trip takes as your speed slows to a crawl? Why does this make sense? How does the graph show this?

1. Write 2 approach statements to describe this graph.

|  |  |
| --- | --- |
| You drive to a destination that is 80 miles away. You spend 3 hours at your destination and then return home at the same speed. | |
| |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Speed | 0.5 mph | 1 mph | 2 mph | 10 mph | 20 mph | 40 mph | 80 mph | 160 mph | | Total Time |  |  |  |  |  |  |  |  | | |
| |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | | Write an equation to match this function. Express the equation two different ways. |
| As your speed gets faster and faster, the total time approaches \_\_\_\_\_\_\_\_\_\_ because |
| As your speed gets closer and closer to 0 mph, your total time approaches \_\_\_\_\_\_\_\_\_\_ ­because |

|  |  |
| --- | --- |
| You buy a refrigerator for your college dorm room that costs $300. It costs $12 to pay for the electricity to run the refrigerator every year. What is the yearly cost to own this refrigerator? | |
| |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | # of years of ownership | 0.25 yrs | 0.5 yrs | 1 yrs | 2 yrs | 5 yrs | 10 yrs | 20 yrs | 40 yrs | | Average yearly cost |  |  |  |  |  |  |  |  | | |
| |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | | Write an equation to match this function. Express the equation two different ways. |
| As the number of years you own the refrigerator gets bigger and bigger, the average yearly cost approaches \_\_\_\_\_\_\_\_\_\_ because |
| As the number of years you own the refrigerator approaches 0, the average yearly cost approaches \_\_\_\_\_\_\_\_\_\_ because |

|  |  |
| --- | --- |
| To pay for the DJ, the photographer and the decorations at the Winter Dance, the costs are $800. This cost will be evenly divided among all students who attend the dance. Additionally, the food for each student costs $8. How much will the tickets cost per student? | |
| |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | # of Students | 1 | 2 | 10 | 30 | 50 | 100 | 200 | 500 | | Ticket Price |  |  |  |  |  |  |  |  | | |
| |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | | Write an equation to match this function. Express the equation two different ways. |
| As the number of students gets bigger and bigger, the ticket price approaches  because |
| As the number of students approaches 0, the ticket price approaches  because |

Extension

|  |  |
| --- | --- |
| You are trying to make some lemonade. You start with a mixture of lemonade your sister made that has a concentration of 80% lemonade mix with 20% water. This is way too sweet so you start adding another mixture of lemonade that is only 10% lemonade mix. What is the concentration of the new mixture? | |
| |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | # of Liters of 10% mix | 0.5 | 1 | 2 | 30 | 50 | 100 | 200 | 500 | | New Concentration |  |  |  |  |  |  |  |  | | |
|  | Write an equation to match this function. Express the equation two different ways. |
| As you add more liters of the less-sweet mixture, the concentration of the new mixture approaches \_\_\_\_\_\_\_\_\_\_  because |